

CAMSHAFT CHAIN TENSIONER

Removal/Installation

NOTE

The camshaft chain tensioner assembly cannot be serviced, if it is not functioning properly, it must be replaced.

1. Loosen the sealing bolt, then remove the bolts securing the camshaft chain tensioner (Figure 80) to the cylinder and remove the tensioner assembly from the cylinder.
2. Remove the gasket and discard it.
3. Remove the sealing bolt and washer from the center of the tensioner.
4. Install a new gasket on the cylinder.
5. Remove the sealing bolt and washer.
6. Insert a flat bladed screwdriver into the sealing bolt opening (Figure 81).
7. Screw the adjuster *clockwise* to fully retract the tensioner.
8. Hold the tensioner plunger in this fully retracted position and remove the screwdriver.
9. Insert a piece of wire into the opening (Figure 82) to wedge the tensioner plunger in this position.
10. Install the cam chain tensioner lifter assembly onto the cylinder and install the bolts. Tighten the bolts to the torque specification listed in Table 2.
11. Remove the piece of wire and listen for a “click” to make sure the plunger was released from the retracted position and is up against the cam chain.
12. Install the sealing bolt and washer and tighten to the torque specification listed in Table 2.

PISTON, PISTON PIN AND PISTON RINGS

The piston is made of an aluminum alloy. The piston pin is made of steel and is a precision fit. The piston pin is held in place by a clip at each end.

Piston Removal

1. Remove the cylinder head cover, camshaft, cylinder head and cylinder as described in this chapter.

WARNING

The edges of all piston rings are very sharp. Be careful when handling them to avoid cutting fingers.

2. Remove the top ring with a ring expander tool or by spreading the ends with your thumbs just enough to slide the ring up over the piston (**Figure 83**). Repeat for the remaining rings.

3. Before removing the piston, hold the rod tightly and rock the piston as shown in **Figure 84**. Any rocking motion (do not confuse with the normal sliding motion) indicates wear on the piston pin, piston pin bore or connecting rod small-end bore (more likely a combination of these).

NOTE

Wrap a clean shop cloth under the piston so that the piston pin clip will not fall into the crankcase.

4. Remove the clip from each side of the piston pin bore (**Figure 85**) with a small screwdriver or scribe. Hold your thumb over one edge of the clip when removing it to prevent the clip from springing out.
 5. Use a proper size wooden dowel or socket extension and push out the piston pin.

CAUTION

Be careful when removing the pin to avoid damaging the connecting rod. If it is necessary to gently tap the pin to remove it, be sure that the piston is properly supported so that lateral shock is not transmitted to the lower connecting rod bearing.

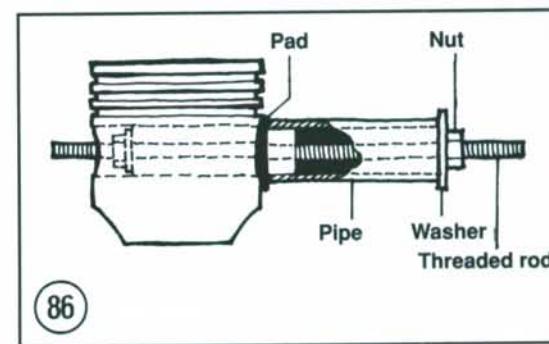
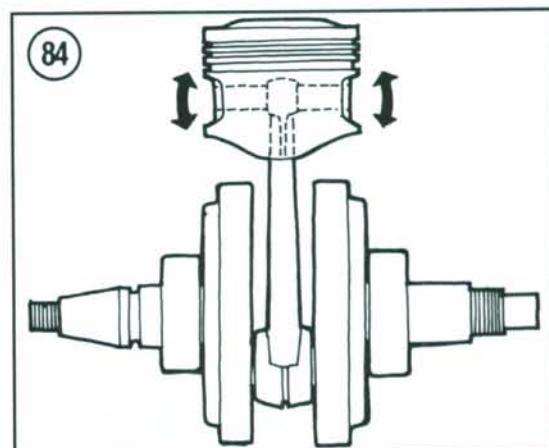
6. If the piston pin is difficult to remove, heat the piston and pin with a butane torch. The pin will probably push right out. Heat the piston to only about 140° F (60° C), i.e., until it is too warm to touch, but not excessively hot. If the pin is still difficult to push out, use a homemade tool as shown in **Figure 86**.

7. Lift the piston off the connecting rod.

8. If the piston is going to be left off for some time, place a piece of foam insulation tube over the end of the rod to protect it.

Inspection

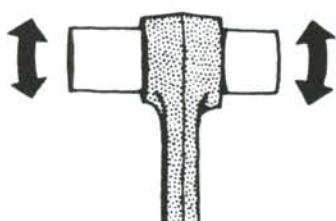
1. Carefully clean the carbon from the piston crown with a chemical remover or with a soft scraper (**Figure 87**). Do not remove or damage the carbon ridge around the circumference of the piston above the top ring. If the piston, rings and cylinder are found to be dimensionally correct and can be reused,



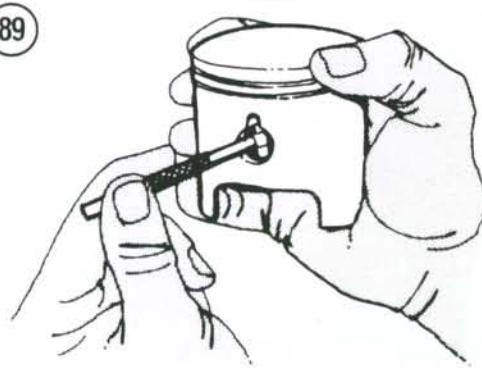
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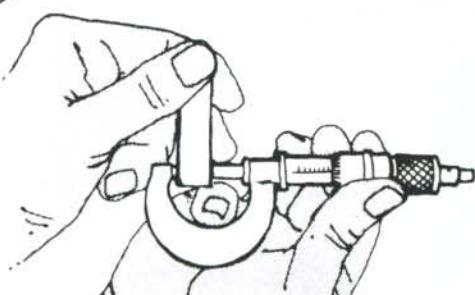
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removal of the carbon ring from the top of the piston or the carbon ridge from the top of the cylinder will promote excessive oil consumption.

CAUTION

Do not wire brush the piston skirts.

2. Examine each ring groove for burrs, dented edges and wide wear. Pay particular attention to the top compression ring groove as it usually wears more than the other grooves.

3. If damage or wear indicates piston replacement, select a new piston as described under *Piston Clearance* in this chapter.

4. Oil the piston pin and install it in the connecting rod. Slowly rotate the piston pin and check for radial and axial play (**Figure 88**). If any play exists, the piston pin should be replaced, providing the rod bore is in good condition.

5. Measure the inside diameter of the piston pin bore with a snap gauge (**Figure 89**) and measure the outside diameter of the piston pin with a micrometer (**Figure 90**). Compare with dimensions given in **Table 1**. Replace the piston and piston pin as a set if either or both are worn.

6. Check the piston skirt for galling and abrasion which may have been caused by piston seizure. If light galling is present, smooth the affected area with No. 400 emery paper and oil or a fine oilstone. However, if galling is severe or if the piston is deeply scored, replace it.

Piston Clearance

1. Make sure the piston and cylinder walls are clean and dry.

2. Measure the inside diameter of the cylinder bore at a point 13 mm (1/2 in.) from the upper edge with a bore gauge (**Figure 75**).

3. Measure the outside diameter of the piston across the skirt (**Figure 91**) at right angles to the piston pin. Measure at a distance 10 mm (0.40 in.) up from the bottom of the piston skirt.

4. Piston clearance is the difference between the maximum piston diameter and the minimum cylinder diameter. Subtract the dimension of the piston from the cylinder dimension and compare to the dimension listed in **Table 1**. If the clearance exceeds that specified, the cylinder should be rebored to the next oversize and a new piston installed.

5. To establish a final overbore dimension with a new piston, add the piston skirt measurement to the specified clearance. This will determine the dimension for the cylinder overbore size. Remember, do not exceed the cylinder maximum service limit inside diameter indicated in **Table 1**.

Piston Installation

1. Apply molybdenum disulfide grease to the inside surface of the connecting rod.
2. Oil the piston pin with assembly oil or fresh engine oil and install it in the piston until its end extends slightly beyond the inside of the boss (**Figure 92**).
3. Place the piston over the connecting rod with the "IN" mark (**Figure 93**) on the piston crown directed toward the intake port or the rear of the engine.
4. Line up the piston pin with the hole in the connecting rod. Push the piston pin through the connecting rod and into the other side of the piston until it is even with the piston pin clip grooves.

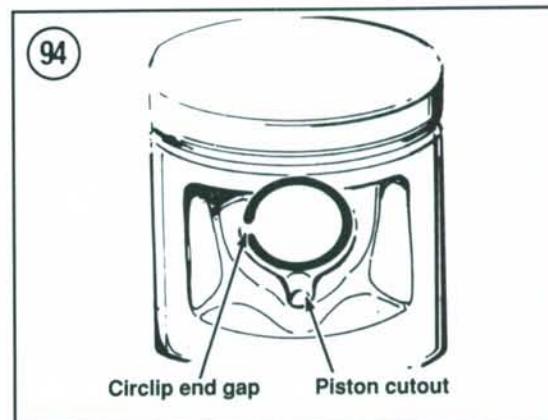
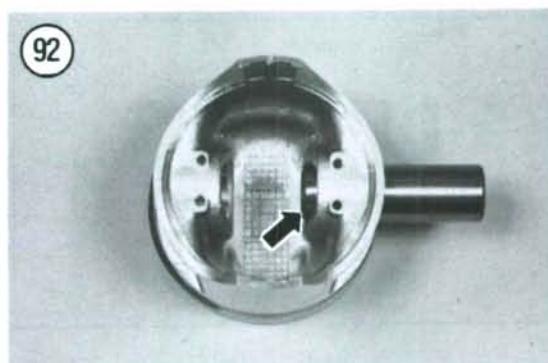
CAUTION

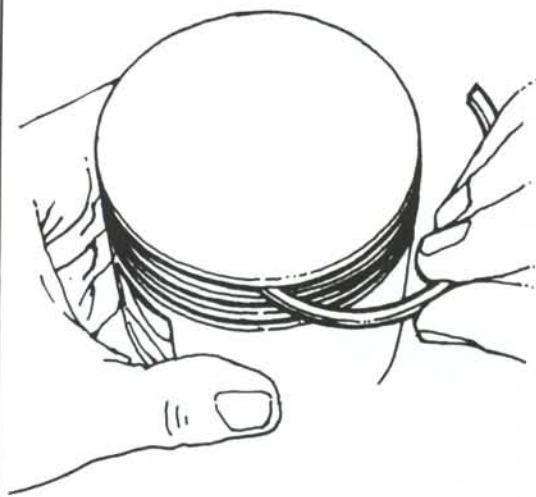
If it is necessary to tap the piston pin into the connecting rod, do so gently with a block of wood or a soft-faced hammer. Make sure you support the piston to prevent the lateral shock from being transmitted to the connecting rod bearing.

NOTE

*In the next step, install the clips with the gap away from the cutout in the piston (**Figure 94**).*

5. Install new piston pin clips in both ends of the pin boss. Make sure they are seated in the grooves in the piston.
6. Check the installation by rocking the piston back and forth around the pin axis and from side to side along the axis. It should rotate freely back and forth but not from side to side.
7. Install the piston rings as described in this chapter.
8. Install the cylinder, cylinder head, camshaft and cylinder head cover as described in this chapter.



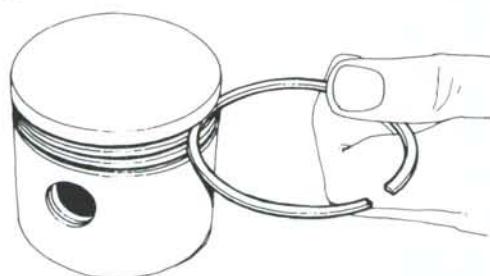
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Piston Ring Replacement

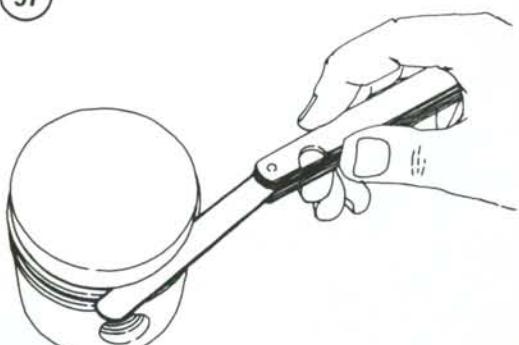
WARNING

The edges of all piston rings are very sharp. Be careful when handling them to avoid cutting fingers.

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1. Remove the top ring by spreading the ends with your thumbs just enough to slide the ring up over the piston (**Figure 83**). Repeat for the remaining rings.

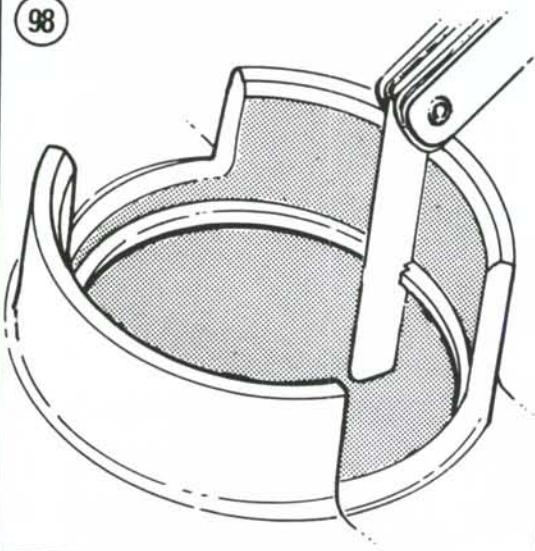
2. Carefully remove all carbon buildup from the ring grooves with a broken piston ring (**Figure 95**). Inspect the grooves carefully for burrs, nicks or broken and cracked lands. Recondition or replace the piston if necessary.

3. Roll each ring around its piston groove as shown in **Figure 96** to check for binding. Minor binding may be cleaned up with a fine-cut file.

4. Measure the side clearance of each ring in its groove with a flat feeler gauge (**Figure 97**) and compare to dimensions given in **Table 1**. If the clearance is greater than specified, the rings must be replaced. If the clearance is still excessive with the new rings, the piston must also be replaced.

5. Measure each ring for wear. Place each ring, one at a time, into the cylinder and push it in about 20 mm (3/4 in.) with the crown of the piston to ensure that the ring is square in the cylinder bore. Measure the gap with a flat feeler gauge (**Figure 98**) and compare to dimensions in **Table 1**. If the gap is greater than specified, the rings should be replaced.

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When installing new rings, measure their end gap in the same manner as for old ones. If the gap is less than specified, carefully file the ends (**Figure 99**) with a fine-cut file until the gap is correct.

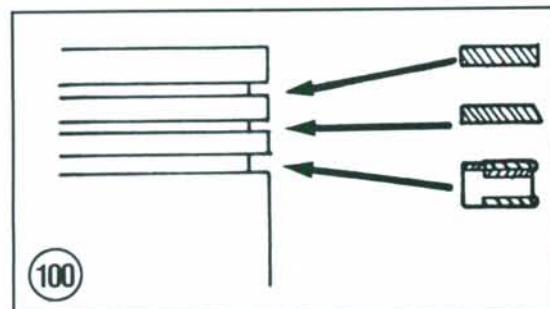
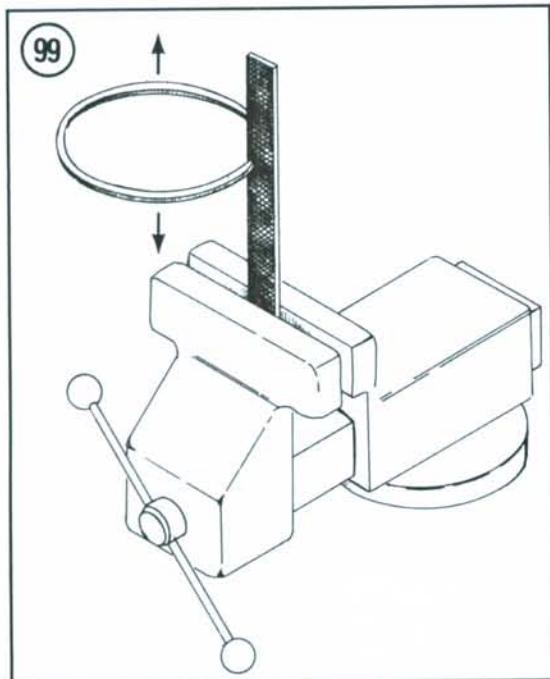
6. Install the piston rings in the order shown in **Figure 100**.

NOTE

Install the compression rings with their markings facing up.

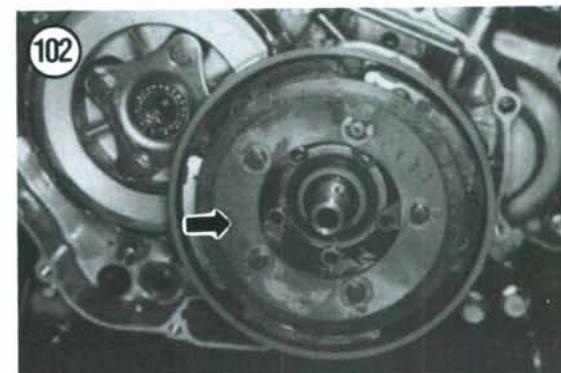
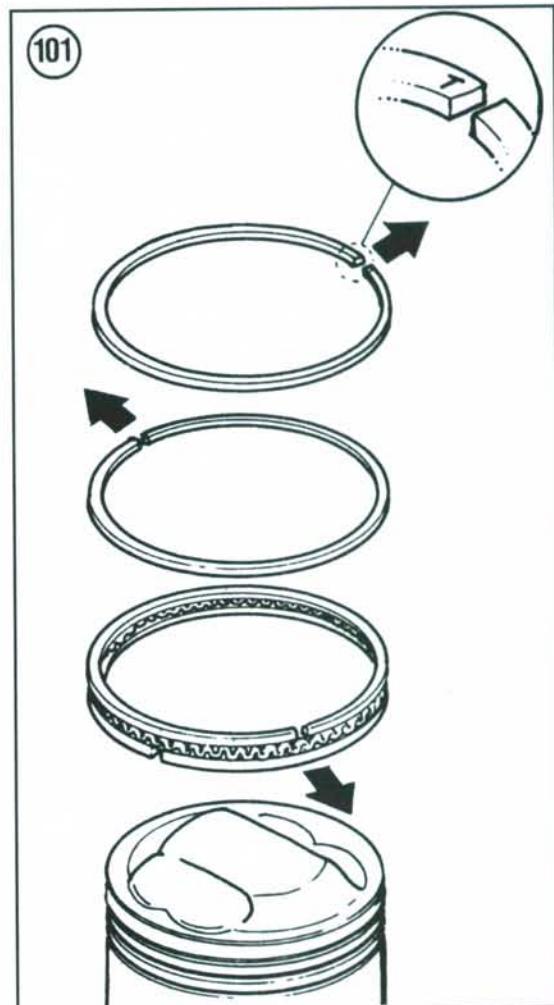
7. Install the oil ring spacer first, then the side rails. Some new oil ring side rails do not have top and bottom designations. If reassembling used parts, install the side rails as they were removed.

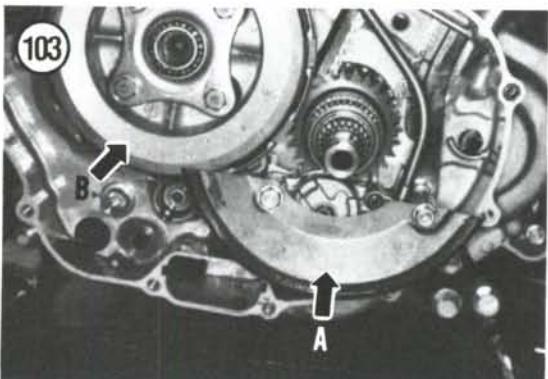
8. Install the second compression ring, then the top—by carefully spreading the ends of the ring with



your thumbs and slipping the ring over the top of the piston. Remember that the marks on the piston rings are toward the top of the piston.

9. Make sure the rings are seated completely in their grooves all the way around the piston and that the





ends are distributed around the piston as shown in **Figure 101**. The important thing is that the ring gaps are not aligned with each other when installed.

10. If new rings were installed, measure the side clearance of each ring in its groove with a flat feeler gauge (**Figure 97**) and compare to dimensions given in **Table 1**.

11. Follow the *Break-in Procedure* in this chapter if a new piston or piston rings have been installed or the cylinder was reamed or honed.

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OIL PUMP AND PRIMARY DRIVE GEAR

The oil pump is located on the right-hand side of the engine forward of the clutch assemblies. The oil pump and primary drive gear can be removed with the engine in the frame.

Removal

1. Drain the engine oil as described in Chapter Three.

2. Remove the right-hand crankcase cover as described in this chapter.

3. Remove the centrifugal clutch assembly (**Figure 102**) as described in Chapter Seven.

4. Remove the bolts securing the oil separator plate (A, **Figure 103**) and remove the plate.

5. Remove the manual clutch assembly (B, **Figure 103**) as described in Chapter Seven.

6. Remove the union bolt (A, **Figure 104**) and the black bolt (B, **Figure 104**) securing the oil pipe assembly to the crankcase.

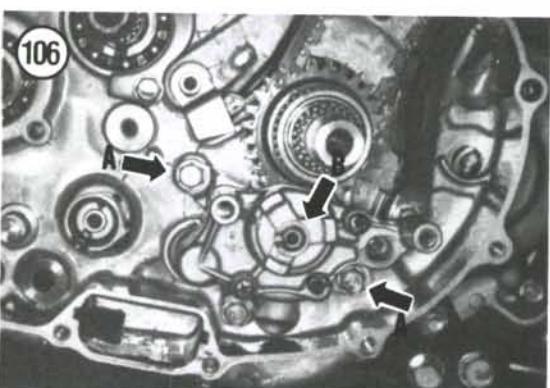
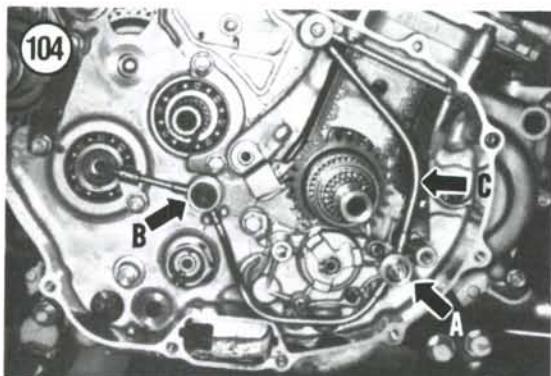
7. Remove the oil pipe assembly (C, **Figure 104**). Don't lose the O-ring seal (**Figure 105**) at the upper end of the oil pipe.

8. Remove the bolts (A, **Figure 106**) securing the oil pump and remove the oil pump assembly (B, **Figure 106**).

9. Don't lose the locating dowels (A, **Figure 107**) and O-ring seal (B, **Figure 107**) in the crankcase.

10. Inspect the oil pump as described in this chapter.

11. To remove the primary drive, slide off the primary drive gear (**Figure 108**) and the thrust washer.



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